

GEPHE SUMMARY

BMP15 (https://www.gephebase.org/search-criteria?/and+GeneGephebase=~BMP15~#gephebase-summary-title)	Gephebase Gene	GP00000147	GepheID
	Entry Status	Martin	Main curator
	Published		

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+TraitCategory=~Physiology~#gephebase-summary-title)		Trait Category	
Fertility (increased ovulation rate) (https://www.gephebase.org/search-criteria?/and+Trait=~Fertility (increased ovulation rate)~#gephebase-summary-title)		Trait	
Ovis aries		Trait State in Taxon A	
Ovis aries - Hanna - Increased ovulation rate; Heterozygote shows phenotype; homozygote results in ovarian failure		Trait State in Taxon B	
Taxon A		Ancestral State	
Domesticated (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Domesticated~#gephebase-summary-title)		Taxonomic Status	
Taxon A		Taxon B	
Ovis aries (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~Ovis aries~#gephebase-summary-title)		Ovis aries (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~Ovis aries~#gephebase-summary-title)	
sheep		sheep	
Ovis ammon aries; Ovis orientalis aries; Ovis ovis; sheep; domestic sheep; lambs; wild sheep; Ovis aries Linnaeus, 1758		Ovis ammon aries; Ovis orientalis aries; Ovis ovis; sheep; domestic sheep; lambs; wild sheep; Ovis aries Linnaeus, 1758	
species		species	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria; Artiodactyla; Ruminantia; Pecora; Bovidae; Caprinae; Ovis		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria; Artiodactyla; Ruminantia; Pecora; Bovidae; Caprinae; Ovis	
Ovis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9935)		Ovis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9935)	
9940 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9940)		9940 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9940)	
No		Yes	
		Hanna	

GENOTYPIC CHANGE

Bmp15		Q9Z0L4 (http://www.uniprot.org/uniprot/Q9Z0L4)	
Bmp-15; C86824; C87336; GDF-9B; AU015375; AU018861; AU021453; Gdf9b		AHB23439 (https://www.ncbi.nlm.nih.gov/nuccore/AHB23439)	
10090.ENSMUSP00000024049 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=10090.ENSMUSP00000024049)			
Belongs to the TGF-beta family.			
GO:0005125 : cytokine activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005125)			
GO:0008083 : growth factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008083)			
GO:0005160 : transforming growth factor beta receptor binding			

(<https://www.ebi.ac.uk/QuickGO/term/GO:0005160>)

GO - Biological Process

- GO:0045893 : positive regulation of transcription, DNA-templated (<https://www.ebi.ac.uk/QuickGO/term/GO:0045893>)
- GO:0001541 : ovarian follicle development (<https://www.ebi.ac.uk/QuickGO/term/GO:0001541>)
- GO:0030509 : BMP signaling pathway (<https://www.ebi.ac.uk/QuickGO/term/GO:0030509>)
- GO:0048468 : cell development (<https://www.ebi.ac.uk/QuickGO/term/GO:0048468>)
- GO:0060016 : granulosa cell development (<https://www.ebi.ac.uk/QuickGO/term/GO:0060016>)
- GO:0010862 : positive regulation of pathway-restricted SMAD protein phosphorylation (<https://www.ebi.ac.uk/QuickGO/term/GO:0010862>)
- GO:0042981 : regulation of apoptotic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0042981>)
- GO:0043408 : regulation of MAPK cascade (<https://www.ebi.ac.uk/QuickGO/term/GO:0043408>)
- GO:0060395 : SMAD protein signal transduction (<https://www.ebi.ac.uk/QuickGO/term/GO:0060395>)

GO - Cellular Component

- GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)
- GO:0005615 : extracellular space (<https://www.ebi.ac.uk/QuickGO/term/GO:0005615>)

Presumptive Null

Yes (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes~#gephebase-summary-title>)

Molecular Type

Coding (<https://www.gephebase.org/search-criteria?/and+Molecular Type=~Coding~#gephebase-summary-title>)

Aberration Type

SNP (<https://www.gephebase.org/search-criteria?/and+Aberration Type=~SNP~#gephebase-summary-title>)

SNP Coding Change

Nonsense

Molecular Details of the Mutation

c.67C>T p.Q23*

Experimental Evidence

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping~#gephebase-summary-title>)

	Taxon A	Taxon B	Position
Codon	CAG	TAG	67
Amino-acid	Gln	STP	23

Main Reference

Mutations in an oocyte-derived growth factor gene (BMP15) cause increased ovulation rate and infertility in a dosage-sensitive manner. (2000) (<https://pubmed.ncbi.nlm.nih.gov/10888873>)

Authors

Galloway SM; McNatty KP; Cambridge LM; Laitinen MP; Juengel JL; Jokiranta TS; McLaren RJ; Luiro K; Dodds KG; Montgomery GW; Beattie AE; Davis GH; Ritvos O

Abstract

Multiple ovulations are uncommon in humans, cattle and many breeds of sheep. Pituitary gonadotrophins and as yet unidentified ovarian factors precisely regulate follicular development so that, normally, only one follicle is selected to ovulate. The Inverdale (FecXI) sheep, however, carries a naturally occurring X-linked mutation that causes increased ovulation rate and twin and triplet births in heterozygotes (FecXI/FecX+; ref. 1), but primary ovarian failure in homozygotes (FecXI/FecXI; ref. 2). Germ-cell development, formation of the follicle and the earliest stages of follicular growth are normal in FecXI/FecXI sheep, but follicular development beyond the primary stage is impaired. A second family unrelated to the Inverdale sheep also has the same X-linked phenotype (Hanna, FecXH). Crossing FecXI with FecXH animals produces FecXI/FecXH infertile females phenotypically indistinguishable from FecXI/FecXI females. We report here that the FecXI locus maps to an orthologous chromosomal region syntenic to human Xp11.2-11.4, which contains BMP15, encoding bone morphogenetic protein 15 (also known as growth differentiation factor 9B (GDF9B)). Whereas BMP15 is a member of the transforming growth factor beta (TGFbeta) superfamily and is specifically expressed in oocytes, its function is unknown. We show that independent germline point mutations exist in FecXI and FecXH carriers. These findings establish that BMP15 is essential for female fertility and that natural mutations in an ovary-derived factor can cause both increased ovulation rate and infertility phenotypes in a dosage-sensitive manner.

Additional References

RELATED GEPHE

Related Genes

3 (B4GALNT2, BMP receptor IB (BMPRI), GDF9) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=~9940~/and+Trait=Fertility/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

9 (<https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~BMP15~/and+Taxon ID=~9940~/or+Gene Gephebase=~BMP15~/and+Taxon ID=~9940~#gephebase-summary-title>)

EXTERNAL LINKS

COMMENTS

@HeterozygoteAdvantage @SexualTrait <https://omia.org/OMIA001350/9940/>